

## **REMARKS/ARGUMENTS**

### **Amendments to the Specification**

The amendments update a cross reference, add two words which were obviously missing, and clarify the wording in two places. The clarifications are mentioned below in response to claim rejections.

### **Status of the Claims**

Prior to the entry of this amendment, claims 1-8 were pending in this application. In the Office Action all claims were rejected under 35 USC 112 first and second paragraphs.

The present amendment amends independent claim 1, also makes amendments to dependent claims 3 and 5 and adds new claim 9. Therefore, claims 1-9 are presented for further examination.

No new matter is added by the amendments.

### **Rejections under 35 USC 112 second paragraph**

The present invention addresses the issue of accurate depth measurement. When collecting data (such as resistivity data relating to the formation, mentioned at page 5 line 7) while drilling, it is desirable to associate that data with accurate depth measurements. Determinations of depth by measuring the drillstring as it goes into the hole are inaccurate because the drill pipe can stretch.

Claim 1 has now been expanded and amended to meet the clarity objection under 35 USC 112. A step of determining the uncorrected depths from lengths at the surface is recited, beginning with the word “determining..” This provides antecedent for wording to

clarify the step of calculating corrections by stating that it is the depths determined from surface conditions which are corrected. The final step of the claim has been amended to become a step of associating data with corrected depths, and then a step of making use of the data and associated corrected depth measurements.

Support for the language used is provided by the reference to “measurement of depth at surface” in line 6 of page 3 (note also line 19 of page 1) and the words “assign depths to data measured downhole” at line 7 of page 3.

It is respectfully submitted that this clarification and amendment to the claim deals with the specific points made by the examiner and it is requested that the rejections under the second paragraph of 35 USC 112 is withdrawn.

**Rejections under 35 USC 112 first paragraph**

The examiner has raised questions about several passages in the description.

**Concerning reference to a model on page 3.** This is reference to a model in step number 4. Over the page in step 7 there is a sentence “The models used here and in step 4 above (are) preferably known models such as Drillsafe™.” This makes it apparent that there are existing models known to those skilled in this art.

**Concerning reference to computation on page 4.** The key points of the approach are set out in the numbered steps on pages 3 and 4. Dimensions and weight of the drillstring and geometrical parameters of the wellbore are inputs. Frictional forces on the drill string depend on then rig state (i.e. the state of the drilling operation). That is under the control of the driller, and hence known, but in any event the automatic detection of the rig state is set out in detail in the earlier applications referred to.

The present application then sets out a procedure. The rig state allows a model and a friction factor to be chosen. Weight on bit can be estimated or measured. This allows computation of hookload and the computed value is tested against the actual measured value. The computed value is matched to the measured value by altering the friction factor and/or

by altering the value for weight on bit. Once this has been done, these adjusted values, together with the inputs in the preceding paragraph are used to calculate the amount of stretch in the drillstring.

This procedure is equivalent to an algorithm, but it is set out in words rather than algebraic symbols. Implementing the procedure will involve engineering calculations based on known laws of physics and will be within the competence of those skilled in this art.

**Concerning the increase in stretch, the examiner is correct.** The second half of the relevant sentence, at lines 5 and 6 of page 5, is intending to say that the depth of the bottom of the hole, as determined from the measurements of drillstring length made at the surface, is shallower than the true depth of the bottom of the hole. The sentence concerned has been split into two and amended to enhance its clarity.

**Concerning *data* mentioned at page 5 line 17,** the context is that Figure 2 has been described, beginning at line 23 of page 4. (This leads up to contrast with Figure 3). On page 4, lines 25 and 26 state that the first frame of Figure 2 is a plot of depth, determined by surface measurement and hence uncorrected, against time. Page 5 lines 6 to 8 state that the second frame of Figure 2 is a plot of measured resistivity against time. With this description of Figure 2 laid out, page 5 line 17 introduces Figure 3 and makes a general reference to “data” in order to point out that Figure 3 incorporates correction in accordance with correction. The nature of the data becomes apparent from the drawing Figures and the subsequent description which points out features in Figure 3.

It can be seen that the vertical axes in the frames of Figures 2 and 3 are the same, that the time scales in the first two frames of both figures are the same and that the horizontal axis of the third frame is resistivity. The first frame of Figure 2 notes a depth discrepancy whereas the first frame in figure 3 shows that the discrepancy has been removed by correction in accordance with the invention. This is pointed out by page 5 lines 21 to 23 as well as by the wording on the first frame of Figure 3. The resistivity against time plots in

Figures 2 and 3 are identical, because they are simply a record of measured values against time. However, the depth against resistivity plot in Figure 2 has a defect and loss of information, because of the discrepancy in depth determinations whereas the use of corrected depths in constructing the depth against resistivity plot which is the third frame of Figure 3 has no such defect, as is pointed out by the sentence at lines 23 and 24 of page 5.

Thus, the “data” mentioned in a general way at line 17 of page 5 is the depth determinations and the association of depths with measured resistivity values. In order to clarify this section of the text, the phrase at page 5 line 17 has been amended to refer to “corrections”.

**Concerning “calculated” at line 20**, this is calculation in accordance with the steps numbered 1 to 10 on pages 3 and 4, as discussed above.

Applicants submit that these comments on the points raised by the examiner are an adequate explanation, and request that the rejections under 35 USC 112 first paragraph are withdrawn.

**New claim 9**

This new independent claim is intended to include the features of claim 1 as now amended, and also recite steps of the manner of calculation given on pages 3 and 4 and discussed above.

**CONCLUSION**

In view of the foregoing, Applicants believe all claims now pending in this Application are in condition for allowance. The issuance of a formal Notice of Allowance at an early date is respectfully requested.

In the event that a fee or refund is due in connection with this Amendment, the Commissioner is hereby authorized to charge any underpayment or credit any overpayment to Deposit Account No 19-0615. If the Examiner believes a telephone conference would expedite prosecution of this application, please telephone the undersigned.

Respectfully submitted,

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